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SOURCE

A. A. Vvedenskiy, Termodinamicheskiye Raschety Protsessov Toplivoi Promyshlennosti, Gostoptekhnizdat, (LC No TJ265.V9).

A REVIEW OF A. A. VVEDENSKIY'S BOOK,
"THERMODYNAMIC CALCULATIONS OF FUEL INDUSTRY PROCESSES"

Heat treatment of petroleum crude materials (pyrolysis, cracking, and re-forming) predominated up to World War II, although catalytic processes were introduced to an increasing extent immediately before the war. At the same time, production of high-octane components such as methohexane, isooctane, and derivatives of the benzene series began to be expanded. At present catalytic processes (catalytic cracking, hydroforming, polymerization, isomerization, and alkylation of isobutane and benzene) are firmly introduced into the petroleum industry, and their relative importance, which is already great, is increasing rapidly.

Another comparatively recent tendency is adoption on a broad scale of chemical methods of treatment. Notwithstanding the complexity of the crude material and the multiplicity of homogeneous and nonhomogeneous (catalytic) methods of treatment used in the petroleum industry, the fundamental reactions applied there in various combinations are comparatively few. They comprise cracking (decomposition) hydrogenation, dehydrogenation, polymerization, isomerization, alkylation, and cyclization. It has been established that all these reactions are reversible. A study of equilibrium conditions of these reactions from the thermodynamic viewpoint is of great practical importance, because it enables one to predict the nature of the products formed and their yields in a certain process. Much has been published on the subject, but theory rather than practical application has been emphasized. This book is intended for petroleum engineers and technologists who must solve problems encountered in the petroleum industry and the fuel industry in general.

In the section on the conversion of methane, the extensive occurrences in the USSR of natural gas containing in some cases up to 98-99 percent methane are mentioned. Possibilities of utilizing this raw material include: (1) thermal decomposition for the production of hydrogen (to be used in the hydrogenation of fats, destructive hydrogenation of hydrocarbons, and hydrogenation of coal), together with the production of carbon black; (2) reactions of methane with water vapor or carbon dioxide to form mixtures for the synthesis of methanol and higher alcohols, synthin, etc., and the use of these reactions for the production of hydrogen; and (3) the partial oxidation of methane to carbon monoxide and hydrogen, a gas mixture which can be used in the aforementioned types of production.

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The section on the hydrogenation of aromatic hydrocarbons contains extensive data on the hydrogenation of methyl benzene, ethyl benzene, n-propyl benzene, isopropyl benzene, and 1,2, 4-terimethyl benzene. The alkylation of aromatic hydrocarbons and the hydroforming of paraffinic hydrocarbons leading to aromatic products are treated in detail.

Two thousand copies of this edition of the book have been published.

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